

**PROPOSED MIXED USE DEVELOPMENT
WAKEFIELD ROAD
MAPPLEWELL
BARNSELY**

**PLANNING APPLICATION BY
PIPESTONE GROUP LIMITED**

AIR QUALITY ASSESSMENT

Environmental Studies
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1. INTRODUCTION

Leeds City Council has been contracted by John R Paley Associates, acting on behalf of Pipestone Ltd to undertake a suitable Air Quality Assessment to be submitted with a mixed-use residential and commercial planning application for a site at Mapplewell, Nr. Barnsley.

Chris Shields of Barnsley Metropolitan Borough Council's (BMBC) Regulatory Services team has advised that Nitrogen Dioxide (NO₂) is the main pollutant of concern in the vicinity of the proposed development and at the nearby junction with Bar Lane. Consequently a number of NO₂ diffusion tubes are already located within the area.

BMBC have stated that at present they are happy for this assessment to be conducted following the methods described in the Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3. Consequently this assessment has been undertaken using the DMRB screening model spreadsheet following the technical guidance contained within the Local Air Quality technical guidance included with TG09 for using the DMRB screening model, background level adjustments and ratio of primary NO₂ emissions calculator.

2. APPLICATION SITE

The proposed development site is known as the former William Freeman factory at Mapplewell, 3 miles north of Barnsley Town Centre. It is located with the A61 Wakefield Road to the west and a disused rail line to the east. The A61 at this location runs in north / south direction and is approximately 8m wide, with 2m wide footways to both sides and is subject to a 30 mph speed limit.

It is proposed to construct 64,500 sq ft of purpose built accommodation, which comprises 12,000 sq ft of office development and 52,500sq ft of commercial in units ranging from 2,500 - 9,000 sq ft. The northern parcel comprises a breakdown of 67 houses and 16 apartments. The southern parcel of the site provides a commercial development accessed by a separate access from A61 Wakefield Road, just north of it's junction with the B6131 Bar Lane.

Its British National Grid 6 figure reference is approximately 434000, 410000.

3. LOCAL AIR QUALITY MANAGEMENT REQUIREMENTS

The air quality objectives applicable to Local Air Quality Management in England are set out in the Air Quality (England) Regulations 2000 (SI 928), The Air Quality (England) (Amendment) Regulations 2002 (SI 3043), and are shown in Table 1.1. This table shows the objectives in units of microgrammes per cubic metre $\mu\text{g}/\text{m}^3$ (milligrammes per cubic metre, mg/m^3 for carbon monoxide) with the number of exceedences in each year that are permitted (where applicable).

TABLE 1. AIR QUALITY OBJECTIVES INCLUDED IN REGULATIONS FOR THE PURPOSE OF LOCAL AIR QUALITY MANAGEMENT IN ENGLAND.

Pollutant	Air Quality Objective		Date to be achieved by
	Concentration	Measured as	
Benzene	16.25 $\mu\text{g}/\text{m}^3$	Running annual mean	31.12.2003
	5.00 $\mu\text{g}/\text{m}^3$	Running annual mean	31.12.2010
1,3-Butadiene	2.25 $\mu\text{g}/\text{m}^3$	Running annual mean	31.12.2003
Carbon monoxide	10.0 mg/m^3	Running 8-hour mean	31.12.2003
Lead	0.5 $\mu\text{g}/\text{m}^3$	Annual mean	31.12.2004
	0.25 $\mu\text{g}/\text{m}^3$	Annual mean	31.12.2008
Nitrogen dioxide	200 $\mu\text{g}/\text{m}^3$ not to be exceeded more than 18 times a year	1-hour mean	31.12.2005
	40 $\mu\text{g}/\text{m}^3$	Annual mean	31.12.2005
Particles (PM_{10}) (gravimetric)	50 $\mu\text{g}/\text{m}^3$, not to be exceeded more than 35 times a year	24-hour mean	31.12.2004
	40 $\mu\text{g}/\text{m}^3$	Annual mean	31.12.2004
Sulphur dioxide	350 $\mu\text{g}/\text{m}^3$, not to be exceeded more than 24 times a year	1-hour mean	31.12.2004
	125 $\mu\text{g}/\text{m}^3$, not to be exceeded more than 3 times a year	24-hour mean	31.12.2004
	266 $\mu\text{g}/\text{m}^3$, not to be exceeded more than 35 times a year	15-minute mean	31.12.2005

4. SCOPE OF THIS ASSESSMENT

The air quality assessment considers NO_2 concentrations at existing nearby receptor properties and at those domestic properties which will be adjacent to the A61 Wakefield Road within the proposed development. It has been verified against 3 No. local monitoring data from 2008, specifically bias adjusted nitrogen dioxide diffusion tube data, located 2 metres from the A61 kerb.

Further assessment has then been undertaken for the forecast year of completion (2014) of the proposed development, based upon the predicted concentrations with and without the proposed development. The outputs of the assessment will be compared against the relevant air quality objectives and limit values, and shall be submitted to the local planning authority for consideration.

5. DATA REQUIREMENTS FOR AIR QUALITY ASSESSMENT

5.1 Background Concentrations

Local Air Quality Management Technical Guidance TG(09) suggests that in many situations the background contribution may represent a significant or dominant proportion of the total pollutant concentration, and it is thus important to give careful consideration to background levels and how they are estimated for future years.

Background concentrations are expected to decline in future years as a result of Government and EU policies and legislation to reduce pollutant emissions. Where appropriate, specific advice on how to treat background concentrations is given in TG(09).

In many instances it is recommended that use is made of the national background maps, which are provided for each 1x1 km grid square across the UK. Where appropriate these data can be supplemented by and compared with local measurements of background. For Nitrogen oxides (NO_x), nitrogen dioxide (NO₂) and particulate matter below 10 µm diameter (PM₁₀), new background maps have been prepared for this Guidance, derived from a 2006 base year, and are provided for all years up to 2020.

The various source contributions to the estimated background concentration in each 1x1 km grid square are now provided, such that it is possible to remove those sources that are explicitly modelled.

A calculator tool is also provided for adjusting the background NO₂ figure to use depending on which sources are to be modelled directly as part of the assessment. Table 2 below shows the 2008 and 2014 background levels calculated using this tool for Grid squares 433000 409000 and 434000 409000.

TABLE 2 BACKGROUND NO₂ CALCULATOR - FOR SOURCE APPORTIONED BACKGROUND NO_x

Easting	Northing	Enter the Mapped Background <u>TOTAL NO_x</u> (µg/m ³)	Enter the <u>SUM</u> of the mapped background NO _x in the sectors <u>TO BE REMOVED</u> (µg/m ³)	Enter the Mapped Background NO ₂ (µg/m ³)	Adjusted Background NO _x (µg/m ³)	Adjusted Background NO ₂ (µg/m ³)	Notes
433000	409000	20.31	0.16	15.26	20.15	15.15	2008 less A-Rds
433000	409000	15.820	0.010	12.280	15.81	12.27	2014 less A-Rds
433000	409000	21.34	0.17	15.92	21.17	15.81	2007 less A-Rds

5.2 Traffic Data

The DMRB screening model used for this assessment requires Annual Average Daily Traffic (AADT) flows for the year being predicted and the proportion of this flow which is classed as Heavy Duty Vehicles.

The traffic data entered in to the DMRB screening model spreadsheet for this Assessment is based on the peak hour count and forecast data used with in the Traffic Impact Assessment Report 08-334-002.02. Further traffic count data supplied by Barnsley MBC has been used

to factor this data to appropriate for use with DMRB. Details on how this was done is included in Appendix 1. Table 3 below outlines the data used for this assessment. The worst case situation was used in each case.

TABLE 3 AADT DATA USED FOR THIS ASSESSMENT.

Link	2008		2014 Do Min		2014 Do Some	
B6131 Bar Lane	10200	15kph	11040	15kph	11065	15kph
A61 south of Bar Lane	22530	20kph	24630	20kph	25350	20 kph
A61 North of Bar Lane	13425	15kph	14700	15kph	15400	15kph
A61 between proposed access points	13425	25kph	14700	25 kph	15220	20kph
A61 North of proposed Access points	13425	40kph	14700	40kph	15400	40kph

* 6% hgv content used in all cases

6 AIR QUALITY ASSESSMENT

6.1 Verification

Receptor points were entered in to the DMRB screening model V1.03 which approximated the position of the three diffusion tube sites provided by Barnsley MBC. Traffic data for 2008 as shown in Table 3. The sources were then split according to the guidance issued in Annex D of Volume 11 Section 3 (Local Air Quality Assessment) of DMRB.

Following the advice issued to Local Authorities for completing the latest Screening and Assessment Review. The DMRB model was run to calculate the traffic component of NO_x contributed by the traffic, which was then entered in to the NO_x to NO₂ calculator issued by AEA Energy & Environment. The results were then compared to the measured data for those locations and are shown in Table 4 below.

TABLE 4 VERIFICATION CALCULATIONS

Receptor number	Name	Year	NO ₂	NO ₂	NO ₂ Difference		Data capture
			Calculated mean $\mu\text{g}/\text{m}^3$	Monitored $\mu\text{g}/\text{m}^3$	$\mu\text{g}/\text{m}^3$	Percentage	
1	Tube 1 2008	2008	29.15	29.3	0.15	1%	100%
2	Tube 2 2008	2008	32.03	33.3	1.27	4%	92%
3	Tube 3 2008	2008	33.76	44	10.24	30%	33%
4	Tube 3 2007	2007	37.44	39.3	1.86	5%	66%

All the diffusion tubes are located within 2m of the kerb and the roads in question are approximately 8m wide. The receptor locations chosen to match the monitored data calculated a very close match for Tubes 1 and 2 located on Bar Lane and A61 North of the Junction. However calculation for Tube 3, south of the Junction did not validate.

This discrepancy between the calculated value and the monitored value for Tube 3 is possibly due to the local wind flow patterns or additional congestion factors, that cannot be

modelled using the screening method. However, the data capture for this Tube 3 is only 33% casting doubt on the accuracy of the monitored annual average quoted.

On further discussion with Barnsley MBC, monitored data for 2007 was made available. Calculation for Tube 3 using 2007 factors worked out to within 5% of the reported figure. It can be seen therefore that the data used within the screening model validates well with the levels reported by Barnsley MBC.

6.2 Assessment of Existing Residential Properties

Following the same methodology as described in Section 6.2 above for verification. Data was entered in the calculators to represent the diffusion tubes site, and representative residential properties on the A61 close to the junction with Bar land and the proposed Development. The results of these calculations are included in Table 5 below.

TABLE 5 RESULTS OF NO₂ CALCULATIONS AT REPRESENTATIVE LOCATIONS

Receptor number	Name	Year	NO _x	NO _x	NO ₂	NO ₂
			Annual mean µg/m ³	Road Contribution ug/m ³	Annual mean µg/m ³	Change µg/m ³
1	Tube 1 08	2008	48.09	27.9	29.15	
	Tube 1 DM	2014	54.35	34.2	22.05	-7.1
	Tube 1 DS	2014	63.88	43.7	22.09	0.04
2	Tube 2 08	2008	37.42	21.7	32.03	
	Tube 2 DM	2014	42.64	26.9	24.18	-7.85
	Tube 2 DS	2014	43.74	28	24.5	0.32
3	Tube 3 08	2008	34.91	21.8	33.76	
	Tube 3 DM	2014	39.78	27.7	24.62	-9.14
	Tube 3 DS	2014	44.69	30	25.42	0.8
4	42 Wakefield Rd	2008	36.37	28.3	24.74	
	42 Wakefield Rd DM	2014	26.79	11.1	17.43	-7.31
	42 Wakefield Rd DS	2014	27.14	11.4	17.56	0.13
5	7 Wakefield Rd	2008	62.92	42.7	32.76	
	7 Wakefield Rd DM	2014	44.00	28.3	24.74	-8.02
	7 Wakefield Rd DS	2014	44.70	29	25.02	0.28
6	437 Wakefield Rd	2008	43.59	42.9	32.83	
	437 Wakefield Rd DM	2014	44.04	27.9	24.58	-8.25
	437 Wakefield Rd DS	2014	63.06	28.3	24.74	0.16

Calculations were performed for the same locations using traffic data and background concentration levels for 2008 and 2014 both with and without the expected impact of the proposed development.

It can be seen with reasonable certainty that the predicted improvement in NO₂ concentrations are in the order of 8 ug/m³ between 2008 and 2014 due to the general cleaning up of the vehicle fleet.

6.3 Impact of the Proposed Development on Existing Properties

Using the traffic data in the TIA, it can be seen from Table 5 that traffic generated by the proposed development is generally likely to contribute less than 0.5 ug/m³ at any given residential property in the area. It can therefore be taken with some certainty that the proposed development is extremely unlikely to cause a noticeable deterioration in local NO₂ levels or be the cause of any local residential property failing to meet any of the air quality objectives.

7 AIR QUALITY AT THE PROPOSED DEVELOPMENT

For completeness, an assessment of the likely NO₂ concentrations north of the northern access point of the development has been undertaken for the year 2014 with the development in place. The resulting NO₂ concentrations represent the annual average concentrations the nearest properties to the A61 are likely to experience on either side of the A61 after the development is completed.

TABLE 6 PREDICTED NO₂ CONCENTRATION LEVELS FOR THE RESIDENTIAL PART OF THE DEVELOPMENT

Receptor number	Name	Year	NO _x	NO _x	NO ₂ *
			Annual mean µg/m ³	Road Contribution ug/m ³	Annual mean µg/m ³
7	4m from the kerb	2014	30.67	15	19.17
	8m from the kerb	2014	29.17	13.5	18.5
	12m from the kerb	2014	27.73	12	17.83
	16m from the kerb	2014	26.47	10.8	17.29

It can be seen from the calculations in Table 6 that the predicted Annual Average NO₂ concentrations is expected be less than 20ug/m³ compared the objective level of 40ug/m³

8 SUMMARY

This air quality assessment has been undertaken using the DMRB screening model spreadsheet following the technical guidance contained within the Local Air Quality technical guidance included with TG09 for using the DMRB screening model, background level adjustments and ratio of primary NO₂ emissions calculator.

The results of assessment method were validated using 2007 and 2008 monitoring and traffic count data which found the output to be robust and in very good agreement with the three diffusion tube sites located close to the site of the proposed development.

Annual average NO₂ levels were then calculated for 3 receptors coincided with residential addresses representative of the most likely properties to suffer poor air quality in the locality. All calculations were repeated using the predicted traffic and background concentration levels expected in 2014 both with and without the development being completed.

Further calculations were then undertaken to assess the likely levels of NO₂ to be experienced by the residential properties nearest to the A61 within the development site.

Although the additional traffic generated by the proposed development is shown to have some impact up on the local air quality. The contribution is shown to be negligible and will not risk any of the air quality objectives and limits being breached.

9 CONCLUSION

The screening assessment shows that it is unlikely that residential properties in the vicinity of the Junction of Bar Lane and the A61 or closer to the proposed development exceeded the air quality strategy objective on annual average NO_2 levels for 2007 or 2008.

The general cleaning up of the vehicle fleet is expected to result in a reduction in NO_2 levels at the properties nearest to the kerb in the region of $8\text{ug}/\text{m}^3$ to a level of around $25\text{ug}/\text{m}^3$ near the junction and $17\text{ug}/\text{m}^3$ opposite the proposed development.

Whilst the traffic generated by the site will undoubtedly generate some additional emissions in the vicinity, the calculation show that in the worst case, this is still likely to be less than $1\text{ug}/\text{m}^3$ in the worst location and much less than $0.5\text{ug}/\text{m}^3$ in general.

This level of increase is negligible and unlikely to be noticed by local residents. The overall levels will still be well below the objective levels and therefore any deterioration in air quality should not be a serious concern in determining this application.

APPENDIX 1 TRAFFIC DATA PROJECTIONS FOR A61 WAKEFIELD ROAD AT PROPOSED SITE ACCESS AND BAR LANE JUNCTION

Existing and Expected Traffic Flows Without Development				
	2008	AM	PM	24 hour
MC		8	18	
Car/LGV		878	1036	
HGV		81	29	
Bus		11	5	
Total		978	1088	13424.3015
Predicted Base Growthed to 2014 (Do Min)				
		AM	PM	24 hour
MC		8	20	
Car/LGV		963	1133	
HGV		89	32	
Bus		12	5	
Total		1072	1190	14697.8558

Generated Traffic Predicted through TIA					
Northern Site Access 2014			Southern Site Access 2014		
	AM	PM		AM	PM
MC	0	0	MC	0	0
Car/LGV	75	67	Car/LGV	64	49
HGV	0	0	HGV	0	0
Bus	0	0	Bus	0	0

Combined Traffic Flows With Development (Do Some)												
North of Northern Access				South of Southern Access				Between Access (worst case)				
	AM	PM	24 hour		AM	PM	24 hour		AM	PM	24 hour	
MC	8	20		MC	8	20		MC	8	20		
Car/LGV	1017	1190		Car/LGV	1012	1164		Car/LGV	1020	1183		
HGV	89	32		HGV	89	32		HGV	89	32		
Bus	12	5		Bus	12	5		Bus	12	5		
Total	1126	1247	15419.1033	Total	1121	1221	15217.67	Total	1129	1240	15393.11	

2008				2014 Do Min				2014 generated				Total 2014 Do Some			
Bar Lane	AM	PM	24hr	Bar Lane	AM	PM	24hr	Bar Lane	AM	PM	24hr	Bar Lane	AM	PM	24hr
MC	6	9		MC	6	9		MC				MC	6	9	
LGV	645	820		LGV	707	897		LGV	3	1		LGV	710	898	
HGV	34	14		HGV	37	15		HGV				HGV	37	15	
BUS	15	10		BUS	17	11		BUS				BUS	17	11	
Total	700	853	10090.97	Total	767	932	11039.64	Total	3	1	25.9909	Total	770	933	11065.63
A61 South				A61 South				A61 South				A61 South			
	AM	PM	24hr		AM	PM	24hr		AM	PM	24hr		AM	PM	24hr
MC	14	27		MC	14	29		MC				MC	14	29	
LGV	1467	1762		LGV	1608	1927		LGV	68	38		LGV	1676	1965	
HGV	113	43		HGV	124	47		HGV				HGV	124	47	
BUS	26	15		BUS	29	16		BUS				BUS	29	16	
Total	1620	1847	22527.62	Total	1775	2019	24652.37	Total	68	38	688.7589	Total	1843	2057	25341.13

The hourly traffic data included with in the Traffic Impact Assessment has been factored up to 24 hour flows through analysis of hourly traffic data for October 2008 on Bar Lane .

A further hourly classified count data set covering the whole of 2007 for the A61 south of its junction with Rotherham Rd has been used to factor the 24 hour flows to an Annual Average Daily Total (AADT). This data set was also used to assess the likely ratio of HGV content between the peak hours and a 24 hour average. All data was supplied by Andrew Bolton of Barnsley MBC traffic monitoring team.

The analysis suggests that using a figure of 6%for HGV content is a reasonable figure to use on the A61 and is likely to be erring on the worst case situation.

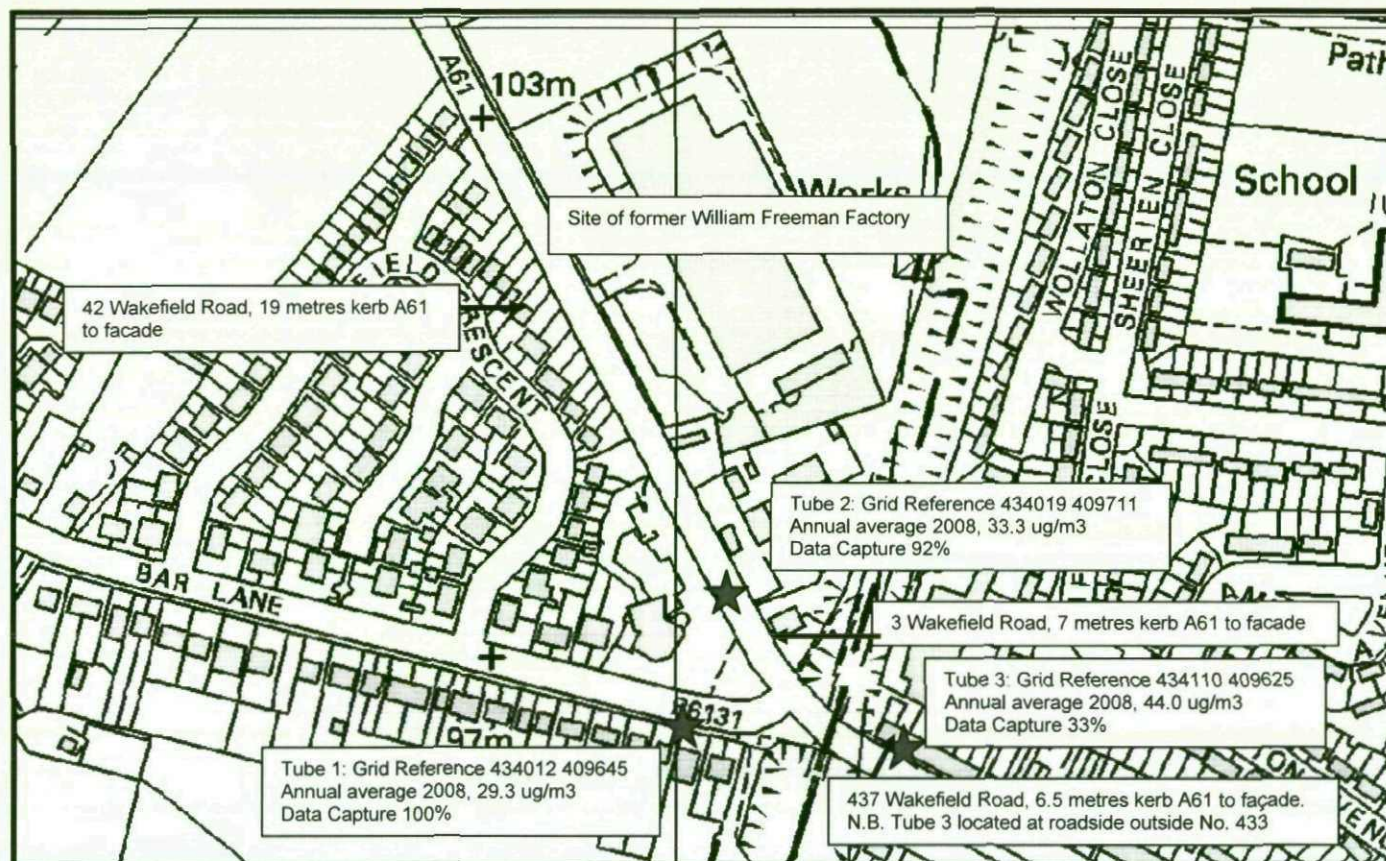
APPENDIX 2

SOURCE DATA USED FOR DMRB SCREENING MODEL.

A	B	C	D	E	F	G
Link number	Distance from link centre to receptor (m)	Traffic flow &		Traffic composition		
		AADT (combined, veh/day)	Annual average speed (km/h)	Road type (A,B,C, D)	Total % LDV	Total % HDV
Tube 1 2008						
1	6	10200	15	A	34	6
2	60	22530	20	A	34	6
Tube 1 2014 DM						
1	6	11040	15	A	34	6
2	60	24630	20	A	34	6
Tube 1 2014 DS						
1	6	11065	15	A	34	6
2	60	25350	20	A	34	6
Tube 2 2008						
1	6	13425	15	A	34	6
2	60	22530	20	A	34	6
Tube 2 2014 DM						
1	6	13425	15	A	34	6
2	60	24630	20	A	34	6
Tube 2 2014 DS						
1	6	13425	15	A	34	6
2	60	25350	20	A	34	6
Tube 3 2008						
1	6	25350	15	A	34	6
2	54	13425	20	A	34	6
Tube 3 2014 DM						
1	6	25350	15	A	34	6
2	54	13425	20	A	34	6
Tube 3 2014 DS						
1	6	25350	15	A	34	6
2	54	13425	20	A	34	6
42 wakefield Road 2008						
1	23	13425	25	A	34	6
42 wakefield Road 2014 DM						
1	23	14700	25	A	34	6
42 wakefield Road 2014 DS						
1	23	15400	25	A	34	6
3 wakefield Road 2008						
1	11	13425	15	A	34	6
2	40	22530	20	A	34	6
3 wakefield Road 2014 DM						
1	11	14700	15	A	34	6
2	40	24630	20	A	34	6
3 wakefield Road 2014 DS						
1	11	15400	15	A	34	6
2	40	25350	20	A	34	6
437 wakefield Road 2008						
1	10.5	13425	15	A	34	6
2	50	22530	20	A	34	6
437 wakefield Road 2014 DM						
1	50	14700	15	A	34	6
2	10.5	24630	20	A	34	6
437 wakefield Road 2014 DS						
1	10.5	15400	15	A	34	6
2	50	25350	20	A	34	6

APPENDIX 3

DIFFUSION TUBE AND RECEPTOR LOCATIONS ASSESSED IN DMRB SCREENING CALCULATIONS



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